

Reply to "Robust estimates of decline for pelagic shark populations in the Northwest Atlantic and Gulf of Mexico"

Baum et al. (2005) challenge our assertion that their analyses of data sets used in their two papers (Baum et al. 2003; Baum and Myers 2004) are inadequate and do not capture the complete picture of all shark populations documented. They further hypothesize that their estimates are "robust" and their measured decline in shark abundance is therefore real, when in fact for many species, particularly pelagic sharks, their status is subject to further scientific analysis.

The appropriate use of data sets and their subsequent analysis is an important issue. We agree that the pelagic logbook data set is one suitable data source because of its large sample size, wide geographic range, and long temporal coverage.

Our main disagreement with the use of these data was their application to coastal sharks (e.g., white shark *Carcharodon carcharias*, blacktip shark *Carcharhinus limbatus*, sandbar shark *Carcharhinus plumbeus*, and hammerhead sharks *Sphyrna* spp., etc.; Burgess et al. 2005). Even so, despite claims that alternate data sources (U.S. observers on Japanese boats, U.S. observers on U.S. boats, Canadian observers on Japanese boats, Canadian observers on Canadian boats) were evaluated by Baum et al. (2003) and deemed not

"suitable" and that the pelagic logbook data set was the best to describe populations of pelagic sharks, we contend that other data series for pelagic sharks are just as valid and some show opposite trends in abundance. For example, Nakano and Clarke (2004) found no change in abundance for blue sharks (*Prionace glauca*) from 1971–2003 using logbook data from the Japanese longline fishery. Even with multiple catch rate series (including the U.S. pelagic logbook), information on catch and bycatch, and the application of three stock assessment models (analyses much more robust than those conducted by Baum et al. 2003), the International Commission for the Conservation of Atlantic Tunas Subcommittee on Bycatches stated that stock assessments on blue sharks and shortfin mako sharks (*Isurus oxyrinchus*) should be considered preliminary because results were highly conditional on the assumptions made and data sources available (Anonymous 2005). Their recommendations were to increase monitoring and research investments for sharks and to acquire more and better data before definitive conclusions could be made on their status.

Despite providing some limited evidence to the contrary in Baum et al. (2005), we are still unconvinced that all factors were taken into account in the analysis by Baum and Myers (2004). We still feel that species identification,

George H. Burgess
Lawrence R. Beerkircher
Gregor M. Cailliet
John K. Carlson
Enric Cortés
Kenneth J. Goldman
R. Dean Grubbs
John A. Musick
Michael K. Musyl
Colin A. Simpfendorfer

Continued from 29

Cooke, S. J., and C. D. Suski. 2004. Are circle hooks an effective tool for conserving marine and freshwater recreational catch-and-release fisheries? *Aquatic Conservation* 14:299-326.

Cortés, E., L. Brooks, and G. Scott. 2002. Stock assessment of large coastal sharks in the U.S. Atlantic and Gulf of Mexico. NOAA NMFS Southeast Fisheries Science Center Sustainable Fisheries Division Contribution SFD-2/03-177.

Hilborn, R., and C. J. Walters. 1992. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Chapman and Hall, New York, NY.

Lande, R., S. Engen, and B. E. Saether. 2003. Stochastic population models in ecology and conservation. Oxford University Press, Oxford, United Kingdom.

Musick, J. A. and C. L. Conrath. 2002. A delineation of shark nursery grounds in Chesapeake Bay and an assessment of abundance of shark stocks (2001–2003). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 2002 Shark Evaluation Workshop Document SB-02-28.

Musick, J. A., G. Burgess, G. Cailliet, M. Camhi, and S. Fordham. 2000. Management of sharks

and their relatives (Elasmobranchii). *Fisheries* 25(3):9-13.

Musick, J. A. 1999. Ecology and conservation of long-lived marine animals. Pages 1-10 in J. A. Musick, ed. Life in the slow lane: ecology and conservation of long-lived marine animals. American Fisheries Society Symposium 23, Bethesda, Maryland.

Musick, J. A., S. Branstetter, and J. A. Colvocoresses. 1993. Trends in shark abundance from 1974 to 1991 for the Chesapeake Bight region of the U.S. mid-Atlantic Coast. In S. Branstetter, ed. Conservation biology of elasmobranchs. NOAA Technical Report 115.

Myers, R. A., and B. Worm. 2005. Extinction, survival, or recovery of large predatory fishes. *Philosophical Transactions of the Royal Society, B* 360:13-20.

Nakano, H. and S. Clarke. 2005. Standardized CPUE for blue sharks caught by the Japanese longline fishery in the Atlantic Ocean, 1971-2003. International Commission for the Conservation of Atlantic Tunas Collective Volume of Scientific Papers 58(3): 1127-1134.

Russell, S. J. 1993. Shark bycatch in the northern Gulf of Mexico tuna longline fishery, 1988-1991, with observations on the nearshore directed shark fishery. In S. Branstetter, ed. Conservation

biology of elasmobranchs. NOAA Technical Report 115.

Schnute, J. T., and R. Hilborn. 1993. Analysis of contradictory data sources in fish stock assessment. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 1916-1923.

Shepherd, T. D., and R. A. Myers. 2005. Direct and indirect fishery effects on small coastal elasmobranchs in the northern Gulf of Mexico. *Ecology Letters* DOI 8(10): 1095-1104.

Ward, P., and R. A. Myers. In press. Do habitat models accurately predict the depth distribution of pelagic fishes? *Fisheries Oceanography*. Available at: fish.dal.ca

_____. 2005. A method for inferring the depth distribution of catchability for pelagic fishes and correcting for variations in the depth of pelagic longline fishing gear. *Canadian Journal of Fisheries and Aquatic Sciences* 62:1130-1142.

Ward, P., R. A. Myers, and W. Blanchard. 2004. Fish lost at sea: the effect of soak time on pelagic longline catches. *Fishery Bulletin* 102:179-195.

Watson, J. W., S. P. Epperly, A. K. Shah, and D. G. Foster. 2005. Fishing methods to reduce sea turtle mortality associated with pelagic longlines. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 965-981.

hook type (e.g., "J" hooks in the 1950s are not the same as "J" hooks in the 1990s), the switch in gear to monofilament, and the change in depth from shallow sets in the 1950s to deeper sets in the 1990s influenced their results more than Baum and colleagues acknowledged. Unfortunately, space prevents us from readdressing many of these factors in detail.

We concur with Baum et al. (2005) that one of the critical areas that could have affected catchability of pelagic species, particularly those that are epipelagic (e.g., oceanic whitetip shark *Carcharhinus longimanus*), was the shift in the depth range of the longline gear. Baum and Myers (2004) applied a depth correction method (Ward and Myers 2005) to account for the change in fishing and feel this is more appropriate than any habitat-based standardization. The gear assumptions in Ward and Myers (2005) postulate a sag rate on longlines of 72° while Bigelow et al. (in press) examined sag rates in over 600 time-depth-recorded commercial longline sets and empirically determined a sag rate of 54° for shallow swordfish sets and 64° for tuna sets. Incorrect depth assumptions will of course influence the depth correction method and any subsequent habitat-based standardization model. Further, the appropriateness of applying a correction factor developed in the tropical Pacific Ocean to other ocean basins is also questionable. Catchability at depth indices for species estimated by Ward and Myers (2005) may not be similar in vastly different oceanographic regions, such as applied to the Gulf of Mexico (Baum and Myers 2004). As Burgess et al. (2005) point out, habitat standardizations prove accurate only when the assumptions regarding habitat choice and fishing gear behavior are correct.

Although we do agree that there have been declines in some shark species and a precautionary approach should be adopted, the status of shark populations cannot be based exclusively on examination of abundance trends, especially from limited databases. Our concerns over choices of data sets, their analyses, and conclusions drawn from those abundance trends are not limited to sharks (Walters 2003; Hampton et al. 2005). The status of shark populations must be based on stock assessments which rely on a range of data in addition to catch rates, including catch and bycatch, size and age composition, tagging, and biological data.

Acknowledgments

We thank Keith Bigelow for comments on depth assumptions of longline gear. Opinions expressed herein are of the authors only and do not imply endorsement by any agency associated with the authors.

References

- Anonymous.** 2005. Report of the 2004 inter-session meeting of the ICCAT subcommittee on bycatches: shark stock assessment. SCRS/2004/014. Collective Volume of Scientific Papers 58(3):799-890.
- Baum, J. K., R. A. Kehler, and R. A. Myers.** 2005. Robust estimates of decline for pelagic shark populations in the northwest Atlantic and Gulf of Mexico. *Fisheries* 30(10):27-30.
- Baum, J. K., R. A. Myers, D. G. Kehler, B. Worm, S. J. Harley, and P. A. Doherty.** 2003. Collapse and conservation of shark populations in the northwest Atlantic. *Science* 299:389-392.
- Baum, J. K., and R. A. Myers.** 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. *Ecology Letters* 7:135-145.
- Bigelow, K. A., M. K. Musyl, F. Poisson, and P. Kleiber.** In press. Pelagic longline gear depth and shoaling: how deep is deep? *Fisheries Research*.
- Burgess, G. H., L. R. Beerkircher, G. M. Cailliet, J. K. Carlson, E. Cortes, K. J. Goldman, R. D. Grubbs, J. A. Musick, M. K. Musyl, and C. A. Simpfendorfer.** 2005. Is the collapse of shark populations in the northwest Atlantic Ocean and Gulf of Mexico real? *Fisheries* 30(10):20-26.
- Hampton, J., J. R. Sibert, P. Kleiber, M. N. Maunder, and S. J. Harley.** 2005. Decline of Pacific tuna populations exaggerated? *Nature* 434: E1-E2.
- Nakano, H., and S. Clarke.** 2004. Standardized CPUE for blue sharks caught by the Japanese longline fishery in the Atlantic Ocean, 1971-2003. International Commission for the Conservation of Atlantic Tunas Collective Volume of Scientific Papers 119.
- Walters, C.** 2004. Folly and fantasy in the analysis of spatial catch rate data. *Canadian Journal of Fisheries and Aquatic Science* 60:1433-1436.
- Ward, P., and R. A. Myers.** 2005. Inferring the depth distribution of catchability for pelagic fishes and correcting for variations in the depth of longline fishing gear. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 1130-1142.



EcoAnalysts, Inc.

**A Leader in Biological
Monitoring Services**

**CELEBRATING 10 YEARS OF SERVICE TO FISHERIES
PROFESSIONALS**

Specializing in the ecology of the lower trophic levels of aquatic ecosystems we can help you acquire valuable information about this portion of the food web and its impacts on fisheries.

Nutrient Limitation Studies

- ✦ We are monitoring taxonomic composition and biomass of periphyton and benthic macroinvertebrates in the Kootenai River (BC, MT, ID) to evaluate the impacts of artificial fertilization.
- ✦ We are participating in a headwater streams research project in western Oregon to determine the potential supply and transport of aquatic invertebrates to fish-bearing reaches of the streams.

Please contact us to see how we can enhance your research and monitoring programs!

www.ecoanalysts.com (208) 882-2555 eco@ecoanalysts.com